DOCUMENT RESUME

ED 349 761 EC 301 507

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TITLE Teaching Phonemic Awareness to Young Children with Disabilities: Blending, Segmenting and Rhyming.
PUB DATE 21 Apr 92
NOTE 13p.; Paper presented at the Annual Conference of the American Educational Research Association (San Francisco, CA, April 20-24, 1992).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Cognitive Development; *Disabilities; *Early Intervention; Generalization; *Language Handicaps; *Learning Readiness; *Phonemics; Prereading Experience; Preschool Education; Reading Readiness; Skill Development; *Teaching Methods; Transfer of Training
IDENTIFIERS Blending (Phonology); Rhyme; Segmentals (Phonology)

ABSTRACT

This study examined the feasibility of teaching phonemic manipulation skills (auditory rhyming, blending, or segmenting) to preschool children with disabilities. Forty-seven children, 4-6 years old, enrolled in a special education preschool, were randomly assigned to receive training in one of three categories of phonemic manipulation tasks (rhyming, blending, and segmenting) or a control condition. Results indicated that children were able to make significant progress in each category of training, but that they demonstrated little or no generalization either within a category of phonemic tasks (e.g., from one type of blending task to another type of blending task) or between categories of phonemic tasks (e.g., from blending to segmenting). However, children who received segmenting training improved in blending continuous sounds. Although the children's level of cognitive development did significantly predict some learning outcomes, it did not appear to limit the learning of phonemic tasks in important ways. Discussion focuses on the nature of phonemic awareness, teaching conditions that might be required to facilitate generalization, and the possibility of preventing or reducing subsequent reading problems through early intervention in this area. (Contains 20 references.) (JDD)

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# Teaching Phonemic Awareness to Young Children with Disabilities: Blending, Segmenting and Rhyming

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Poster presented at the American Educational Research Association Annual Conference in San Francisco, April 21, 1992

Abstract

Building upon the burgeoning research on the role of phonemic awareness in the development of literacy, this study examined the feasibility of teaching phonemic manipulation skills to preschool children with disabilities. Forty-seven children, 4-6 years old, enrolled in a special education preschool, were randomly assigned to receive training in one of three categories of phonemic manipulation tasks (rhyming, blending, and segmenting) or a control condition. Results indicated that children were able to make significant progress in each category of training, but that they demonstrated little or no generalization either within a category of phonemic tasks (e.g., from one type of blending task to another type of blending task) or between categories of phonemic tasks (e.g., from blending to segmenting). Although the children's level of cognitive development did significantly predict some learning outcomes, it did not appear to limit the learning of phonemic tasks in important ways. Discussion focuses on the nature of phonemic awareness, teaching conditions that might be required to facilitate generalization, and the possibility of preventing or reducing subsequent reading problems through early intervention in this area.

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## Purpose

Despite the bulk of research linking poor readers with a lack of phonemic knowledge, few studies examine the potential for teaching specific phonemic skills prior to reading instruction to children who would not otherwise be expected to develop them.

This study investigates that potential by training and testing specific phonemic manipulations (auditory rhyming or blending or segmenting) with groups of young children who might be expected to experience difficulty learning to read.

## Method

47 Subjects

4-, 5-, and 6-year-old children with developmental delays enrolled in an experimental special education preschool program at the University of Washington.

Disabilities: 80% with significant language delays, some with additional handicapping conditions such as physical handicaps, mental retardation, or behavior disorders.

Exclusions: Children who scored 30% or more in a phonemic category on the pretests were eliminated from the subject pool, along with 1 child with autism and 3 children who left the program prior to completion of the study.

Measures

Cognitive ability: The McCarthy Scales of Children's Abilities (McCarthy, 1972): general cognitive index (GCI) with a mean of 100 and a standard deviation of 16. The McCarthy GCI, which is a scaled score, is used to estimate mental age (MA).

Phonemic Awareness Tests. Nine subtests of auditory phonemic skills (three each for rhyming, blending, and segmenting), each assessing a specific task. These subtests were intended to reflect the range of measures used in previous studies (Bradley & Bryant, 1983; Fox & Routh, 1975 & 1984; Lewkowicz, 1980; MacLean, et al., 1988; Yopp, 1988). Each subtest began with 3 nonscored examples on which subjects were given corrective feedback, and 10 scored items on which no feedback was provided beyond encouragement to continue the test.

Rhyming tasks required children to recognize rhyme (Dime/time: Do these words rhyme?), identify rhyme oddity (Cat, hat, bell: Which word does not rhyme?), and produce rhyme (Tell me a word that rhymes with land.).

Blending tasks required children to blend continuous, stretched words (Ssssaaaammm: Say it fast.), blend words divided into onset-rime (S (pause) -am: Say it fast.), and blend words with all sounds separated (S (pause) -a (pause ) -m: Say it fast.).

Segmenting tasks required children to segment two- and three-phoneme words, saying all of the sounds in order (Mob. Say all the little bits in mob.), separate words into

onset-rime (trained through four examples: Mob. Say it this way: M - ob), and say the first sound in words (Mob. Say the first sound in mob.).

None of the items on the pre/posttests were used during training, although the formats were similar. Table 1 provides examples of the tasks, teacher cues, and student responses for each subtest. Pre-, mid-, and posttests were identical except for the addition of three mastery items on the posttests.

Table 1: Examples of Phonemic Skills Test Items

| Test | Teacher Says: | Child Says: |
|---|---|---|
| | Blending | |
| Continuous sounds | Sssaaammm | Sam |
| Onset-rime | S - am | Sam |
| Separated sounds | S - a - m | Sam |
| | Segmenting | |
| Separated sounds | Sam | S - a - m |
| Onset-rime | Sam | S - am |
| First sound | Sam | S |
| | Rhyming | |
| Production | make | shake |
| Oddity | make/tree/shake | tree |
| Recognition | make/shake | yes |

Phonemic Mastery tests: To asses how well children learned the actual tasks and items used during the 7 weeks of instruction, we constructed a mastery test for each of the treatments. The tests consisted of a sample of three items, drawn from the taught items within each of the three task formats in a treatment.

For example, the blending mastery test consisted of nine items (three items from each of the three blending formats).

Procedure

Pretests.

1. McCarthy Scales of Children's Abilities
2. Nine phonemic subtests
3. Letter recognition test

Children who scored more than 30% in any phonemic category at pretest (blending, segmenting, or rhyming) were eliminated from the study.

Design. We employed a randomized block design to create maximally diverse groups while keeping mean age and cognitive ability within each treatment comparable. We combined subjects in both morning classes, separated them by year of birth into three lists of 4-, 5-, and 6-year-olds, then rank ordered subjects within each list by McCarthy GCI. From each block, we randomly assigned children to one of the three treatments or the control group, assigning children in the afternoon classes to groups in a similar manner.

By mixing children from the six preschool classes in each of the four treatments, we minimized the confounding of classroom experiences and treatments. No significant pretreatment differences were found in age, cognitive ability, letter recognition, or phonemic pretests.

Table 2: Descriptive Statistics and Pretest Scores for Each Group

| Measurements | Blenders | Segmenters | Rhymers | Control |
|---|---|---|---|---|
| | Mean (sd) | Mean (sd) | Mean (sd) | Mean (sd) |
| Age (years) | 5.3 (0.6) | 5.2 (0.8) | 5.3 (1.0) | 5.1 (0.8) |
| McCarthy GCI | 69 (24.3) | 72 (18.3) | 72 (22.6) | 70 (30.0) |
| McCarthy MA | 3.8 (1.2) | 3.8 (1.1) | 3.8 (1.2) | 3.7 (1.3) |
| Letter recognition | 5.8 (7.5) | 8.5 (8.2) | 6.7 (8.0) | 9.9 (10.1) |
| Blending | | | | |
| Continuous sounds | 2.8 (3.3) | 3.8 (3.5) | 3.1 (2.6) | 1.2 (2.4) |
| Onset-rime | 0.5 (1.7) | 0.2 (0.6) | 0.5 (0.9) | 0.0 (0.0) |
| Separated sounds | 0.8 (1.3) | 0.2 (0.4) | 0.8 (1.3) | 0.4 (0.7) |
| Segmenting | | | | |
| All sounds | 0 | 0 | 0 | 0 |
| Onset-rime | 0 | 0 | 0 | 0.1 (0.3) |
| First sound | 0 | 0.1 (0.3) | 0 | 0 |
| Rhyming | | | | |
| Production | 1.8 (3.4) | 1.6 (3.3) | 1.2 (2.4) | 1.7 (3.6) |
| Oddity | 1.7 (1.9) | 1.5 (2.3) | 2.4 (2.5) | 2.3 (3.2) |
| Recognition | 4.8 (2.2) | 5.4 (2.1) | 5.5 (1.4) | 5.0 (3.0) |

Instruction. We assembled 13 phonemes into 71 real words to use throughout the three treatments, reserving other phonemes to create a pool of novel testing items. Instruction continued for 7 weeks in groups of 3 to 5 children meeting 4 times each week for 10 minutes per day.

(a) Phase I Training:

Blenders were taught to blend two and three phonemes presented as continuous sounds ("I'll say words the slow way. You'll say them fast. Ssseeeeennnn. What word?" [Children say seen.]). The teacher's efforts were aided by a ceramic squirrel ("Aaaannn") who spoke to the children in stretched words requiring their translation.

Segmenters began separating sounds by saying two- and three-phoneme words slowly, stretching each sound ("We're going to say words slowly, without stopping between the sounds. Seen. Say it slowly." [Children say sseeeeennnn.]). A puppet named Sam, who only understood stretched words, assisted the teachers with this task.

Rhymers were provided with rhyme examples and group practice, then asked to make a rhyme, where children could use the teacher examples as their own ("Lake, sake, shake. These words rhyme. Say lake, sake, shake." [Children say lake, sake, shake.] "Rhyme with sake." [Children say lake or shake, or make a rhyme of their own.]). Teachers used a picture book with rhyming couplets to encourage children to shout out the rhyme to a given cue word.

(b) Phase II Training (4 weeks). We reviewed the previously taught task, and extended training to other tasks within the treatment skill area.

Rhymers continued to produce rhymes, with the additional tasks of identifying whether or not a pair of words rhymed, and selecting from three words the one that did not rhyme.

Blenders were taught to blend words beginning with stop sounds, to blend words with all sounds separated, and to blend onset-rime.

Segmenters were taught to separate words into onset-rime (s-een), say all the separate sounds in words, and to identify the first sound.

Control. As all of our subjects were prereaders, we expected them to have little, if any, prior experience practicing sounds in isolation. Concerned that differences between treatments and control could be confounded by a treatment advantage in hearing and repeating sounds in isolation, the first author met twice individually with children in the control condition during Phase II to practice the isolated sounds used in training. Children were told, "Today we're going to practice saying sounds. Say this sound." The teacher modeled each sound and the children repeated the sounds, which were presented in random order until the child repeated each sound in the set correctly.

Posttests.

1) The nine phonemic subtests described above.

2) The mastery test to children in each treatment, which consisted of selected items used in their training sessions (blenders were given a blending mastery test, segmenters were given a segmenting mastery test, and rhymers a rhyming mastery test).

## Results

Summer term at the preschool limited our instruction to 7 weeks, and the amount of instruction in a given format probably affected the level of mastery of items within that format (see Figure 1). For example, the mean for segmenting each phoneme in a target word (taught during 16 sessions) was 72%, however the mean for saying the first sound (taught in the last 4 sessions) was 33%. Although rhyme recognition (taught during the last 2 weeks) appears to be an exception, guessing all "yes" or all "no" answers could yield a score of 50%. Thus interpreting mastery scores as representations of relative task difficulty is untenable.

Blending. An ANOVA on the posttest scores found significant effects for blending training on all three tasks (blending continuous sounds: $F_{3, 43} = 6.57$, $p = .001$; blending onset-rime: $F_{3, 43} = 7.68$, $p < .001$;; blending separate sounds: $F_{3, 43} = 10.08$, $p < .001$). Pairwise comparisons confirmed that on blending onset-rimes and blending separated sounds, children in the blending group performed significantly better than children in the segmenting, rhyming, or control conditions. For blending continuous sounds, however, blenders and segmenters did not differ. Together, the blenders and segmenters outperformed the rhymers and the control (see Figure 2).

Segmenting. Figure 3 shows pre- and posttest scores on segmenting subtests for each treatment. ANOVAs revealed significant treatment effects for all three segmenting subtests (separating each sound: $F_{3, 43} = 11.92$, $p < .001$; separating into onset-rime: $F_{3, 43} = 8.40$, $p < .001$; and segmenting first sound: $F_{3, 43} = 2.94$, $p < .05$). As expected, pairwise comparisons determined that segmenters performed significantly better than blenders, rhymers, or the control group on these tasks.

This figure demonstrates the importance of examining the source of within-group variance. Segmenters performed better than other groups, however on the latter two tasks only 4 children made measurable gains. The fault might rest with the format of instruction, or with the shorter period of training on these tasks (4 days for first sound). Only 1 child of the 35 not trained to segment made any progress in these tasks.

Rhyming. Figure 4 displays pre- and posttest scores on the rhyming tests. Two of the rhyming tests, oddity and recognition, required forced-choice responses. The chance levels (33% for oddity; 50% for recognition) are indicated in the figure by a horizontal

line. Treatment effects were significant for rhyme production and oddity (rhyme production: $F_{3, 43} = 3.13$, $p < .05$; rhyme oddity: $F_{3, 43} = 3.15$, $p < .05$), with rhymers performing better than children in any other treatment or the control. Results for rhyme recognition, which was a yes/no task, were not significant ($F_{3, 43} = 2.11$, p = ns.). Curiously, the child in the control group who scored well on the pre- and posttest of rhyme production scored below the chance level on oddity and recognition.

## Conclusions

1. Feasibility of Training. We can teach phonemic skills to young children with learning handicaps, and we can teach these skills before children have functional reading ability.

2. Transfer. Results indicated that children who learned the taught skill (e.g., blending continuous sounds) did not necessarily generalize to other skills within the treatment condition (e.g. blending stop sounds). This lack of transfer to other phonemic tasks supports the notion that phonemic skills may be more isolated and specific than the global term "phonemic awareness" implies.

In general, training in one phonemic area also did not lead to improvement in other phonemic skills. Thus blending training did not improve segmentation, and rhyming did not improve blending. One exception occurred, however. Post hoc pairwise comparisons indicated that children who received segmenting training improved in blending continuous sounds. This hint of a facilitating effect could be explored by teaching segmentation to a higher criteria than that achieved in this research.

3. Developmental Readiness. Our subjects, overall, were both younger and lower functioning than those typically selected for phonemic training. Our findings indicated that after mental age was partialled out, our training still accounted for significant amounts of posttest phonemic performance (O'Connor, Jenkins, Leicester and Slocum, in press).

## Summary

The present research answered several questions. Young children with disabilities can acquire specific phonemic manipulation skills. Mental age (at least the range examined in this study) does not appear to seriously limit learning phonemic skills. Short-term training of specific phonemic skills does not produce generalization to other skills within the same class, nor does short-term training of skills within a class (e.g., blending) produce appreciable generalization to other classes of phonemic skills (e.g., segmentation). Research focusing on the relationship among specific phonemic manipulation skills and their contributions to reading will help us identify the metalinguistic factors that contribute to children's readiness for reading instruction.

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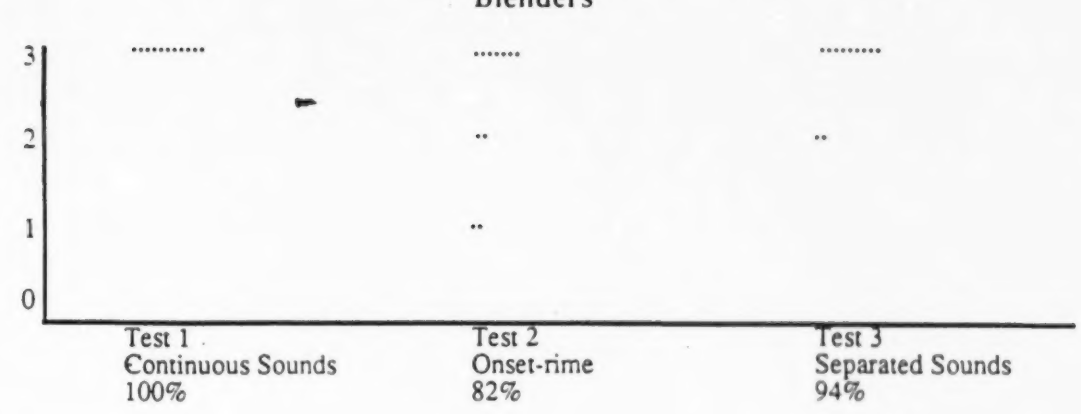
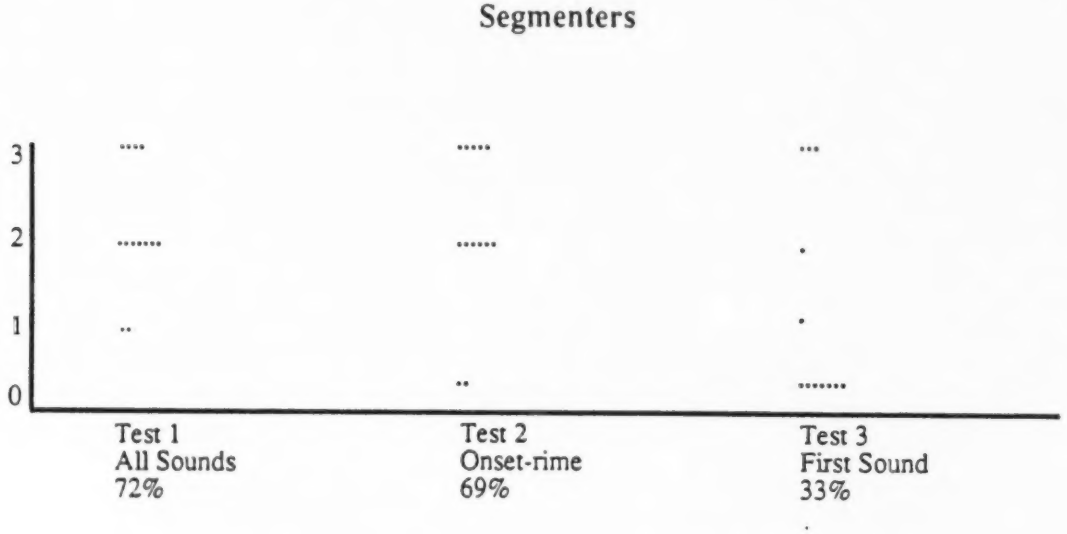
FIGURE 1
Scores of Individual Children on Mastery Tests.



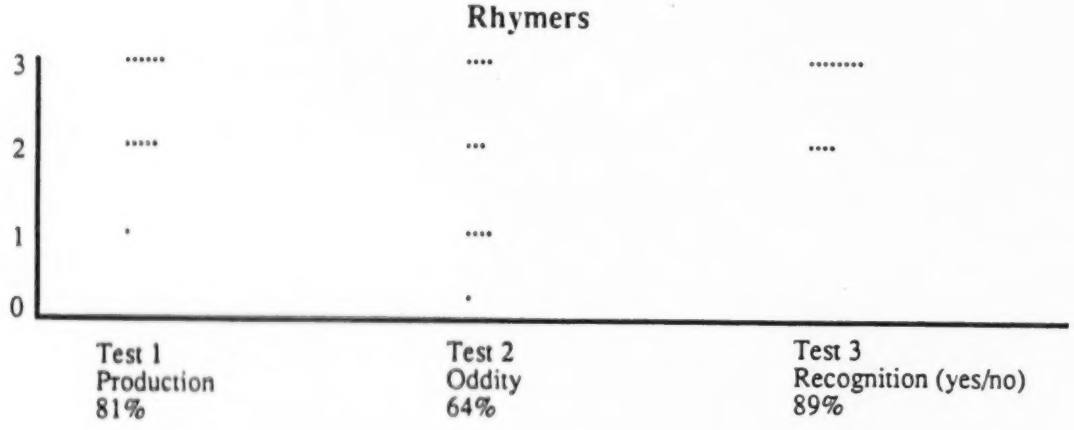
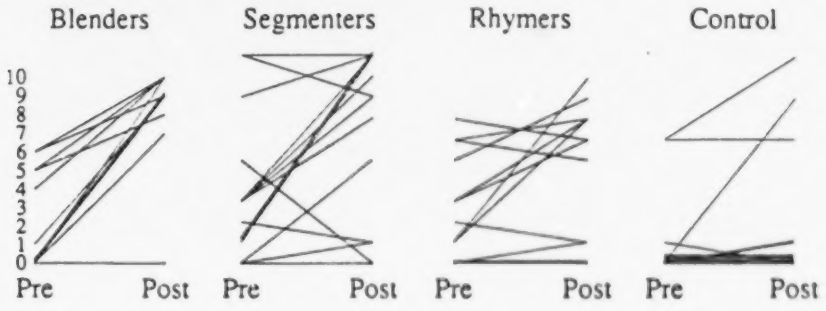



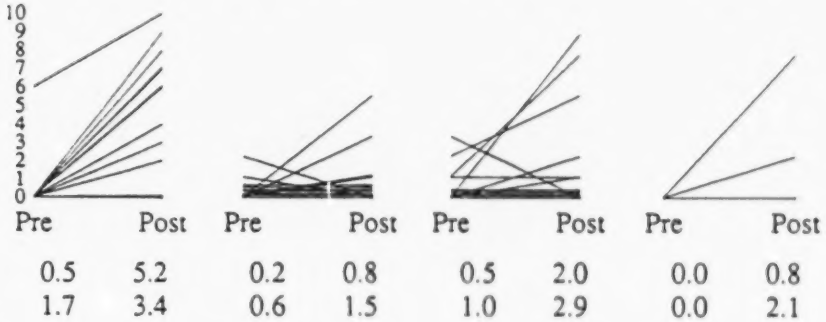
FIGURE 2
Blending Pre- and Posttest Results by Group.
Each Line Represents an Individual Child's Scores.

Blending Test 1: Continuous Phonemes



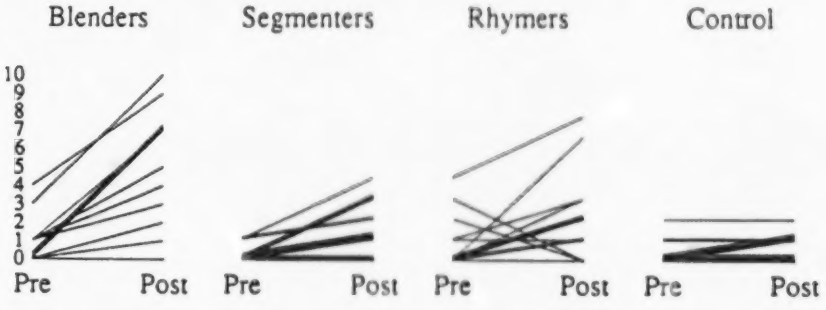

| | Blenders | | Segmenters | | Rhymers | | Control | |
|---|---|---|---|---|---|---|---|---|
| M | 2.9 | 8.3 | 3.7 | 6.9 | 3.1 | 4.7 | 1.2 | 2.4 |
| SD | 3.3 | 2.8 | 3.5 | 3.8 | 2.6 | 3.3 | 2.4 | 3.7 |

Blending Test 2: Onset-rime




| | Blenders | | Segmenters | | Rhymers | | Control | |
|---|---|---|---|---|---|---|---|---|
| M | 0.5 | 5.2 | 0.2 | 0.8 | 0.5 | 2.0 | 0.0 | 0.8 |
| SD | 1.7 | 3.4 | 0.6 | 1.5 | 1.0 | 2.9 | 0.0 | 2.1 |

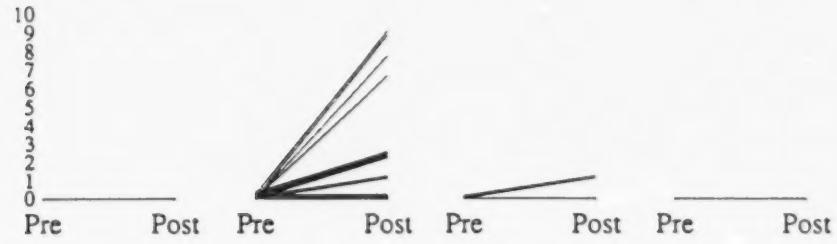
Blending Test 3: Separate Sounds




| | Blenders | | Segmenters | | Rhymers | | Control | |
|---|---|---|---|---|---|---|---|---|
| M | 0.8 | 5.2 | 0.2 | 1.6 | 0.8 | 2.3 | 0.4 | 0.7 |
| SD | 1.3 | 3.2 | 0.4 | 1.3 | 1.3 | 2.2 | 0.7 | 0.6 |

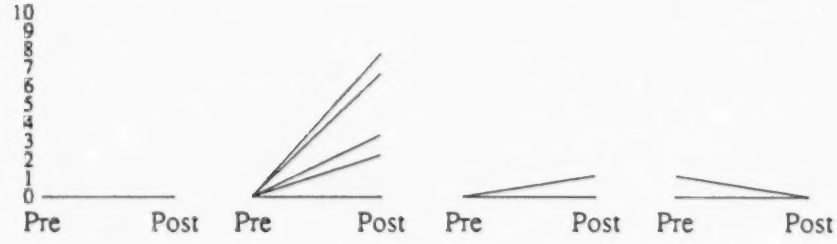
FIGURE 3
Segmenting Pre- and Posttest Results by Group.
Each Line Represents an Individual Child's Scores.

Segmenting Test 1: All Sounds



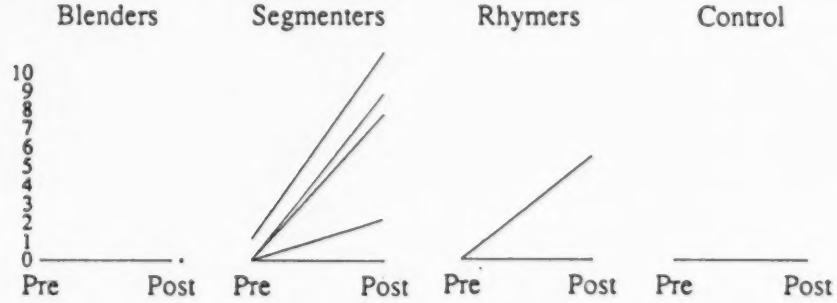

| | Blenders | | Segmenters | | Rhymers | | Control | |
|---|---|---|---|---|---|---|---|---|
| M | 0.0 | 0.0 | 0.0 | 3.7 | 0.0 | 0.2 | 0.0 | 0.0 |
| SD | 0.0 | 0.0 | 0.0 | 3.6 | 0.0 | 0.4 | 0.0 | 0.0 |

Segmenting Test 2: Onset-rime




| | Blenders | | Segmenters | | Rhymers | | Control | |
|---|---|---|---|---|---|---|---|---|
| M | 0.0 | 0.0 | 0.0 | 2.4 | 0.0 | 0.1 | 0.1 | 0.0 |
| SD | 0.0 | 0.0 | 0.0 | 2.8 | 0.0 | 0.3 | 0.3 | 0.0 |

Segmenting Test 3: First Sound

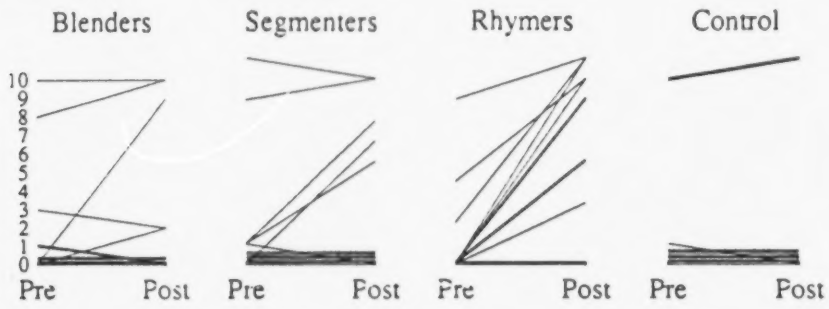



| | Blenders | | Segmenters | | Rhymers | | Control | |
|---|---|---|---|---|---|---|---|---|
| M | 0.0 | 0.0 | 0.1 | 2.1 | 0.0 | 0.4 | 0.0 | 0.0 |
| SD | 0.0 | 0.0 | 0.3 | 3.7 | 0.0 | 1.4 | 0.0 | 0.0 |

FIGURE 4

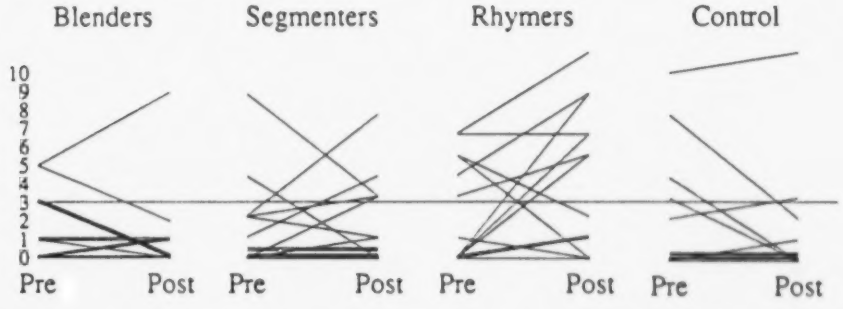
Rhyming Pre- and Posttest Scores by Group.
Each Line Represents an Individual Child's Scores.
Chance Level for Forced-Choice Tests (Oddity and Recognition) Are Indicated With a Horizontal Line.

Rhyming Test 1: Production



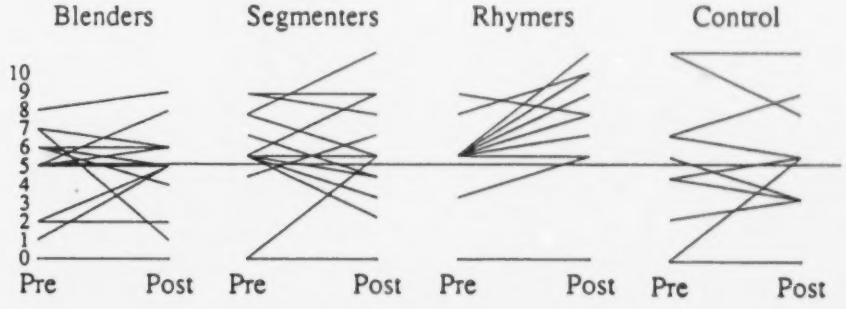

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| M | 1.8 | 2.8 | 1.6 | 2.8 | 1.2 | 6.4 | 1.7 | 1.8 |
| SD | 3.4 | 4.2 | 3.3 | 3.8 | 2.4 | 3.8 | 3.6 | 4.0 |

Rhyming Test 2: Oddity




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| M | 1.7 | 1.3 | 1.5 | 1.7 | 2.4 | 4.3 | 2.3 | 1.5 |
| SD | 1.9 | 2.5 | 2.3 | 2.2 | 2.5 | 3.4 | 3.2 | 3.0 |

Rhyming Test 3: Recognition




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| M | 4.8 | 5.2 | 5.3 | 5.5 | 5.5 | 7.1 | 5.0 | 5.2 |
| SD | 2.2 | 2.2 | 2.1 | 2.2 | 1.4 | 1.9 | 3.0 | 2.3 |